



HP Apollo Series 700, Model 720 PA-RISC Workstation



Overview

The PA-RISC-based Series 700 Model 720 delivers 55.5 SPECmarks, 57 MIPS, and 17 MFLOPS, making it the industry's best price/performance workstation on a desktop. The Model 720, which can also be configured as a server, offers customers industry-leading performance, outstanding graphics, superior networking, and standards-based operating systems.

The Model 720 workstation delivers this unprecedented CPU and graphics performance due to innovation and investment in several key areas: our PA-RISC architecture, graphics enhancements to the architecture, advanced circuit design methodologies, and state-of-the-art compiler technology.

Integrated graphics options include grayscale (GRX), 2D/3D color (CRX), affordable 3D solids (PersonalVRX), and an advanced 3D modeling and rendering system (TurboVRX). While GRX and CRX deliver the industry's leadership

X Window and 2D/3D vector performance, the PersonalVRX and TurboVRX are ideal for solids modeling, rendering, and visualization.

The Model 720 supports the UNIX-based HP-UX operating system and will support OSF/1. In addition, it provides the best ease of use through the HP VUE user interface, based on OSF/Motif.

HP adds to the performance capabilities of the Series 720 with an integrated I/O subsystem, which includes IEEE 802.3/Ethernet, SCSI-II, Centronics, two RS-232 ports, and HP-HIL. In short, the Model 720 gives an HP customer full access to the network and to distributed computing to achieve maximum productivity.

HP – The Leader in RISC-based Systems

Hewlett-Packard is the leader in installed RISC-based systems. As a result, you can count on HP for the experience needed to offer customers the best RISC-based workstations available. Whether you're comparing applications availability, graphics performance, compatibility, price/performance, or investment protection, you'll find that HP is the leader.

HP Computer Museum
www.hpmuseum.net

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Features

Benefits

CPU Performance (50 MHz PA-RISC Processor)

57 MIPS
55.5 SPECmarks
17 MFLOPS
Graphics instructions in the CPU

- Industry's best price/performance
- Speeds technical computations
- High-performance, cost-effective graphics

Memory and Cache

High bandwidth (128 bits wide)
CPU & RAM interface
16-64MB RAM
128KByte Instruction Cache
256KByte Data Cache

- Improves application performance

Mass Storage

210-840MB Internal
10GB max. Disk with SCSI-II Plug-in
600MB CD ROM, 1.3GB 4mm DAT

- A wide range of mass storage options

Standard Interfaces

Integrated I/O Subsystem
IEEE 802.3 (Thick & Thin Net)
EISA (Optional), SCSI-II, RS 232(2),
Centronics, HP-HIL

- Low cost, high performance
- Allows quick and easy integration in heterogeneous networks
- Simple connection of high-speed, low-cost disks and other peripherals

Cooperative Computing Products

NCS, Passwd Etc

Task Broker
NetLS

- Supports distributed applications; ease of administration in a networked environment
- Provides users with access to all available power on the network
- Allows licensing of applications based on actual usage

2D Graphics

GRX (Grayscale)
870K X11 vectors/second
1.15 million 2D/3D vectors/second
8-bit grayscale
Character hardware
Hardware cursors
19", 1280 x 1024, 72 Hz Monitor

- Leadership windowing and vector performance through X11 and PHIGS
- 256 shades for increased comprehension
- Fast performance for text-intensive applications
- Application performance unaffected by cursor movement
- Superb image detail

CRX (Color 2D, 3D wireframe)

870K X11 vectors/second
1.15 million 2D/3D vectors/second
GPC 3D Wireframe: 20.3*
8-bit Color
8+8 plane double buffering
Character hardware
Hardware cursors
19", 1280 x 1024, 72 Hz Monitor

- Leadership windowing and vector performance ideal for design, engineering, and scientific applications
- Exceptional application performance
- 256 colors aid user comprehension
- Allows smooth movement of dynamic images
- Fast performance for text-intensive applications
- Application performance unaffected by cursor movement
- Superb image detail

Features

3D Graphics

PersonalVRX (Color, 3D solids)

54K triangles/second
37K quads/second
GPCmark 3D Solid: 16.5*
8-bit color
8 + 8 plane double buffering
16-bit Z buffer + 4 overlay planes
Hardware dithering
6th Order NURBS with Trimming
Sectioning
Capping
Interference checking
Contour mapping
Deformation animation
Polyhedron primitive, triangle strip,
quadilateral mesh
Hardware cursors
MOMA 3D windows
Personal Visualizer
Radiosity through progressive
refinement
Ray tracing
Screen door transparency
Depth cueing
Gouraud shading
Phong lighting
Advanced hardware lighting
16 hardware light sources
Wireframe lighting
Gamma correction
6 Axis interpolation
19", 1280 x 1024, 60 Hz Monitor

TurboVRX T2/T4 (Color, 3D Visualization)

Includes all features provided by PVRX, plus:

700K/1.36 million 3D
vectors/sec
671K/882K anti-aliased 3D
vectors/sec
216K/330K triangles/sec
98K/195K quads/sec
GPCmark 3D Solid: 39.2/62.1
24 image planes
24-bit Z buffer + 4 overlay planes
Fast DMA to Frame Buffer
Texture mapping with perspective
interpolation
Anti-aliased vectors
Sub-pixel addressing
12-bit indexing
Color map per window
Alpha blending
Dithering
19", 1280 x 1024, 72 Hz

Graphics Software

X11/PHIGS, X11 Starbase
X11/GKS

Wavefront's Personal Visualizer
(with PVRX and TVRX options)

User-friendly Features

HP VUE, OSF/Motif, X11 Window
System
Instant Ignition

Benefits

- Fast solids rendering through X11/Starbase and X11/PHIGS
- Exceptional application performance
- 256 simultaneous colors
- Allows smooth movement of dynamic images
- Speeds modeling and design
- Realism eliminates errors and reduces costly prototypes
- Increases control and interactivity of spline-based models
- Permits arbitrary viewing of model sections
- Makes sectioned models appear solid
- Instant visual check for interference
- Contours calculated in real time
- Deformations can be amplified in real time
- Improved application performance
- Application performance unaffected by cursor movement
- Fast, multiple accelerated windows can be interactively moved
- Easy, advanced rendering
- Quick view-independent rendering of the diffuse quality of light
- Realistic look with sharp reflections and shadows
- Achieves transparency that can be easily layered
- Wireframe clarity
- Provides smooth color transitions across polygons
- Adds reflections to Gouraud shaded models
- Increased realism with no loss in performance
- Increased accuracy of lighting
- Improved wireframe clarity
- Corrects non-linearity of monitors
- Rapid color interpolation
- Superb image detail
- High performance rendering allows manipulation of the largest models
- Exceptional application performance
- Realism eliminates errors and reduces costly prototypes
- Highest performance animation of images
- Maps user defined textures onto geometry to reduce polygons and increase interactivity
- Eliminates "jaggies" to increase effective line resolution
- Improves line placement
- Provides much finer color changes
- True color in up to 15 windows simultaneously
- Improves transparency by varying it across a surface
- Increases realism with fewer image planes
- Superb image detail
- Speed and realism through standards enhance the capabilities of all applications
- Allows users to produce highly realistic renderings without large investment or training
- Offers the best ease of use through standards
- Provides immediate productivity through a pre-installed and preconfigured HP-UX environment



Technical Specifications

System Processing Unit

Central Processor

PA-RISC

Clock Frequency: 50 MHz

Performance:

SPECmarks	55.5
MIPS	57
MFLOPS	17

Memory Management Unit

Virtual Memory Address Space

48 bit

Instruction TLB and Data TLB:

96 page entries, 4 variable block entries,
fully associative

External Cache

Instruction Cache Size

128Kbytes

Organization

Direct mapped

Bus Width

32 bits

Instruction Cache Bus Performance

200MB/sec I-fetch (4 byte)

Data Cache Size

256Kbytes

Organization

Direct mapped

Bus Width

64 bits

Data Cache Peak Bus Performance

400MB/sec load (8 byte)

400MB/sec single store (8 byte)

Main Memory

Type

ECC (single bit correct,
double bit detect)

RAM

16Mbytes standard

Main Memory Bus Width

128 data bits, 16 check bits

Main Memory Bus Peak Performance

200MB/sec (64 byte duration)

System DRAM Technology

80nsec, 4 Mbit DRAM

Maximum Memory

64Mbytes

Memory Options

16, 24, 32 & 64 MB

Software

Operating System

HP-UX 8.01: Complies with IEEE

POSIX.1-1988, FIPS 151-1, ANS

X3.159-1989, proposed POSIX.2 FIPS

(June 1990), System V Interface Definition

(SVID) Issue II (Base System and all

Extensions except AS, NS, and shmat

(KE_OS)), X/Open Portability Guide Issue

III (XPG3), (Base Component and all

Optional Components except COBOL

and XTI).

HP-UX 8.05: In addition to the above,
HP-UX 8.05 also complies with IS 9945/1
and Base Component and all Optional
Components except XTI only.

Window Systems

X Window Systems, Version 11

Release 4 (X11R4), OSF/Motif 1.2

Languages

C

C++

Pascal

FORTRAN

ANSI C

PA-RISC 1.1

Assembler

User Interface

HP VUE 2.0 (with HP-UX 8.05, HP VUE 2.01)

Human Interface

Keyboard

109 Key, low profile, HP-HIL; available in
9 languages

Mouse

3 button, rollerball, HP-HIL

Audio

Three independent time generators
controllable over 30db

Frequency Range

81.46Hz to 83.3KHz

(Available via speaker connected to
external jack 250mW @8 ohms)

Interface Specifications

Type

HP-HIL, 1.0 Amps, built-in audio beeper

Device Limit

7 per interface

Connector

AMP SMD

Networking Options

LAN

IEEE 802.3 LAN with interface with
ThinMAU and BNC "T" connector and
AUI (jumper selectable)

Networking Products

NCS, NFS

Berkeley 4.3 TCP-IP

BSD 4.3 Network Services and

ARPA Services

(HP-UX 8.05 also supports HP Diskless)

I/O Specifications

Graphics Bus (standard)

1 slot

Width

32-bit address

Peak Bus Perf.

100Mbytes/sec (block move out, 32 bytes)

LAN Interface (standard)

Type

IEEE 802.3/Ethernet

Data Rate

10 Mbits/sec

Connectors

15-pin AUI and BNC "T"

SCSI Interface (standard)

Type

SCSI-II: single-ended, 8 bit

Data Rate

5 Mbytes/sec synchronous

1.5 Mbytes/sec asynchronous with
standard length cables

Device Limit

5 devices (with HP-UX 8.01)

7 devices (with HP-UX 8.05)

Connector

ALT-1 of SCSI-II 50-pin high density

Serial Interface (two standard)

Type

EIA RS232C, CCITT V.24/V.28

Data Rate

To 460.8 Kbps (HP-UX 8.01 and
HP-UX 8.05)

Connector

9 pin male DTE (PC Standard)

Parallel Interface (standard)

Type

Centronics, BUSY handshake

Data Rate

300+ Kbytes/sec with DMA

200Kbytes/sec sustained

Connector

25 pin female (PC Standard)

EISA Bus (not supported in HP-UX 8.01)

Number of slots

1 (optional)

Width

32-bit address, 32-bit data

Peak Bus Perf.

25 Mbytes/sec seq. mem. write

EISA SCSI-II Card (optional)

Type

SCSI-II, 8-bits differential

Data Rate

10MB/sec synchronous;

up to 5MB/sec asynchronous

Device Limit

7 per interface

Connector

SCSI-II 50 pin shielded high density

EISA HP-IB Card (optional)

Type

IEEE-488-1978 and IEEE-488A-1980

Data Rate

500KB/sec standard speed;

1MB/sec high-speed

Device Limit

14 standard speed devices;

7 high-speed devices

Connector

IEEE 488 24 position microribbon

EISA LAN Card (optional)

Type

IEEE 802.3/Ethernet

Data Rate

10Mbit/sec

Connector

15 pin AUI and BNC "T"

Optional Internal Mass Storage

Max Mass Storage Devices

Two 3.5-inch mechanisms

Max Internal Mass Storage

840MB

Internal 210MB Disk

Number Supported

up to 2

Operating System

HP-UX 8.01

Size

3.5 inch

Formatted Capacity

210MB

Average Seek Time

15.5 ms

Average Latency

8.33 ms

Read Write/Sequential Access

with 2 x 210MB (Internal)

2.46MB/sec

Internal 420MB Disk

Number Supported

up to 2

Operating System

HP-UX 8.01

Size

3.5 inch

Formatted Capacity

420MB

Average Seek Time

14.5 ms

Average Latency

8.33 ms

Read Write/Sequential Access

with 2 x 420MB (Internal)

2.46MB/sec

with 1 x 420MB (Internal)

1.52MB/sec

3.5-inch Floppy

Number Supported

1 per unit

Operating System

HP-UX 8.05

Size

3.5 inch

Media

HP 2MB or HP 1MB Floppy disk

Formatted Capacity

1.44MB or .720MB

Format

MFM or FM

Transfer Rate

500KB/sec or 250KB/sec

Track to Track Access Time

3 ms

Average Latency

100 ms

Average Access with Latency

194 ms

Optional External Mass Storage

HP-UX 8.01 Support

Max. Ext. Mass Storage

660Mbytes

Total Max. Mass Storage

1.5Gbytes

Products supported on built-in SCSI-II bus

C2213A (660MB disk, CD ROM, DAT)

HP-UX 8.05 Support

Max. Ext. Mass Storage

9GB

Total Max. Mass Storage

10GB

Products supported on built-in SCSI-II bus

C2213A (660MB disk, CD ROM, DAT)

Products supported on EISA HP-IB card

9144A 67MB .25 inch Cartridge tape

9145A 133MB .25 inch Cartridge tape

External 660MB Disk

Operating System

HP-UX 8.01 and 8.05

Size

5.25 inch

Formatted Capacity

660MB

Average Seek Time

16 ms

Average Latency

8.33 ms

Read Write/Sequential Access

with 3 x 660MB MB (External)

6 MB/sec

External 1.3GB Disk

Operating System

HP-UX 8.05

Size

5.25 inch

Formatted Capacity

1.3GB

Average Seek Time

14.5 ms

Average Latency

8.33 ms

Read Write/Sequential Access

with 3 x 1.3GB (External)

6 MB/sec

External Digital Audio Tape Drive

Max. number supported

1 per unit

Operating System Support

HP-UX 8.05

Size

5.25 inch full height

Media Type

60 meter (120 min) DAT

Capacity

1.3Gbytes

Format

Helical-scan DAT

Max. burst data transfer rate

1.5Mbytes/sec

Max. sustained data transfer rate

183Kbytes/sec

Average Random Access Time

20 seconds

External CD-ROM Drive

Max. number supported

1 per unit

Operating System Support

HP-UX 8.05

Size

5.25 inch half height

Media diameter

4.7 inches

Number of surfaces

1

Average data transfer rate

153Kbits/sec

Average Random Access Time

350 msec

Physical and Environmental

SPU Power

Source Consumption

5.4 A max @ 115V

3.0 A max @ 230V

Auto Ranging

90-132 Volts

180-264 Volts

Line Frequency

47-66Hz

Power Consumption

310 max. Watts

1058 BTU/hour

267Kcal/hour

Physical Dimensions

Desktop:

Height 114mm (4.5 in.)

Width 508mm (20.0 in.)

Depth 470mm (18.5 in.)

Deskside:

Height 524mm (20.6 in.)

Width SPU 114mm (4.5 in.)

Width Pedestal 254mm (10 in.)

Depth 470mm (18.5 in.)

Net Weight

22.7 Kg (50 lbs.)

Environmental Range Without Internal Mass Storage

Temperature: operating
- 5° to 60° C
Temperature: non-operating
- 40° to 70° C
Operating Humidity 40° C
to 95% R.H. max.
Non-operating Humidity 55° C
to 90% R.H. max.
Maximum Wet Bulb Temperature
40° C
Altitude: operating
4570 meters (15,000 ft.) to 47° C; reduce
ceiling by 286 meters (938 ft.) for each
degree C above 47° C
Altitude: non-operating
15,240 meters (50,000 ft.) to 70° C
Acoustics
Less than 5.0 Bels
Sound Power Level below 35° C
Less than 58 dbA @ 55° C
EMI
Conducted and radiated interference
meets FCC Class A, VCCI Class 1, FTZ
1046/84 Level B
Regulatory Compliance
UL 950, 1st edition; CSA 22.2 No. 220;
IEC 950, 1st edition 1986

Environmental Range With Internal Mass Storage

Temperature: operating
5° to 45° C; 20° C/hr rate of change max.
Temperature: non-operating
- 40° to 60° C
Humidity: Non-condensing Operating
8% to 85% R.H. max.
Operating Max Wet Bulb Temperature
27° C
Humidity: Non-operating
5% to 95% R.H. max.
Non-operating Max Wet Bulb Temperature
46° C
Altitude: operating
3050 meters (10,000 ft.) to 40° C
Altitude: non-operating
15,240 meters (50,000 ft.) to 60° C

Graphics Specifications

GRX - Grayscale

Graphics System Data
Graphics planes
8
Simultaneously displayable colors
256 levels of grayscale
Frame Buffer
1280x1024
Resolution
1280x1024
72Hz Monitor
19" Mono

CRX - Color

Graphics System Data
Graphics planes
8 + 8 double buffered color
Simultaneously displayable colors
256 colors from a palette of 16.7 million
Frame Buffer
1280x1024
Resolution
1280x1024
72Hz Monitor
19" Color

PersonalVRX - 2D/3D Color

3D Graphics System Data
Accelerator
i860
Clock Speed
33MHz
MFlops (Peak Graphics)
66
Color Planes
8 + 8 double buffered color
Virtual 24 planes
Yes (with hardware dithering)
Simultaneously displayable colors
256 from a palette of 16.7 million
Z Buffer
16-bit
Overlay planes
4
Frame Buffer
2048x1024
Resolution
1280x1024
60Hz Monitor
19" Color

PVRX Electrical Specifications: US/Europe

Line Voltage
115V 230V
Voltage Tolerance
88-135 VAC 176-269 VAC
Line Frequency
48-66Hz
Maximum Current
4.0A 2.5A
Power Consumption
241W 822BTU/hour

PVRX Environmental Characteristics

Operating Temperature
0° to 55° C
Non-operating Temperature
- 40° to 70° C
Humidity Operating 40° C
10 to 90%
Max Altitude Operating
4570m (15,000 ft.)
Max Altitude Non-operating
15,240m (50,000 ft.)

PVRX Regulatory Compliance

VDE level B
FCC class A
VCCI class 1
Safety: UL, CSA, IEC

PVRX Physical Characteristics

Height 100mm (3.9 in.)
Width 325mm (12.8 in.)
Depth 455mm (17.5 in.)
Weight 9.1 Kg (20 lbs.)

TurboVRX - 3D Color

3D Graphics System Data are the same for
the T2 and T4 options except where noted.

Accelerators
2-i860 (T2) 4-i860 (T4)
Clock Speed per CPU
40 MHz
MFlops (graphics)
160 (T2) 320 (T4)
Color Planes
24
Color Palette
16.7M
Simultaneously displayable colors
16M
Double buffer
12 + 12
Z-buffer
24
Overlay planes
4
Frame buffer size
2048x1024
Resolution
1280x1024
72Hz color monitor
19"

TVRX Electrical Specifications: US/Europe

Line Voltage
115V/220V
Voltage Tolerance
90-132 VAC/180-240 VAC
Line Frequency
47-67Hz/47-67Hz
Maximum Current
12.0A/8.5A
Power Consumption
780W/780W

TVRX Environmental Characteristics

Operating Temperature
0° to 55° C
Non-operating Temperature
- 40° to 75° C
Humidity Operating 40° C
5 to 95%
Max Altitude Operating
4570m (15,000 ft.)
Max Altitude Non-operating
15,240m (50,000 ft.)

TVRX Regulatory Compliance

VDE level B
FCC class A
VCCI class 1
Safety: UL, CSA, IEC

TVRX Physical Characteristics

Height 720mm (28.4 in.)
Width 375mm (14.8 in.)
Depth 710mm (28 in.)
Weight 53.6 Kg (118 lbs.)

Monitors			
Physical Characteristics	19" Mono (GRX)	19" Color (CRX, TVRX)	19" Color (PVRX)
Screen Refresh	72Hz	72Hz	60Hz
Video Signals	RS-343 A	RS-343 A	RS-343 A
Resolution	1280x1024	1280x1024	1280x1024
Height	471mm (18.6 in.)	471mm (18.6 in.)	482mm (19 in.)
Width	500mm (20 in.)	500mm (20 in.)	480mm (18.9 in.)
Depth	505mm (20.2 in.)	505mm (20.2 in.)	533mm (19.9 in.)
Net Weight	30 Kg (66.5 lbs.)	29 Kg (64.3 lbs.)	31 Kg (69.5 lbs.)
Electrical Specifications			
Line Voltage	88-135 VAC 193-269 VAC	88-135 VAC 193-269 VAC	90-132 VAC 198-264 VAC
Line Frequency	47-63 Hz	47-63 Hz	47-63 Hz
Maximum Current	1.6A	2.7A	3.5A-1.8A
Power Consumption	100 Watts max.	175 Watts max.	250 Watts max.
Environmental Characteristics			
Operating Temperature	0°-40° C	0°-40° C	0°-40° C
Non-operating Temperature	- 40°-71° C	- 40°-71° C	- 40°-65° C
Humidity: Operating 40° C	15%-95% RH	15%-95% RH	15%-95%
Max. Altitude Operating	4570m (15,000 ft.)	4570m (15,000 ft.)	4570m (15,000 ft.)
Max. Altitude Non-operating	15,240m (50,000 ft.)	15,240m (50,000 ft.)	15,240m (50,000 ft.)
Regulatory Compliance			
VDE level	B	B	B
FCC class	A	A	A
VCCI class	2	1	I
Safety	UL, CSA, EN 60, 950/6-88, DHHS 21, IEC 950	UL, CSA, EN 60, 950/6-88, DHHS 21, IEC 950	(UL, SCA, IEC)

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